PREDICTORS OF FALLS IN THE ELDERLY

- A RETROSPECTIVE AND CASE-CONTROL STUDY OF CASES PRESENTED AT THE EMERGENCY DEPARTMENT OF THE NATIONAL UNIVERSITY HOSPITAL, SINGAPORE

DR.HEMENDRA MISRA
MBBS (India), M.Med-PH (Singapore)

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SUMMARY

Background & Purpose

Older people frequently fall. Falls have traditionally been recognised as one of the "giants" of geriatric medicine. Prospective studies have reported that 30% to 60% of community dwelling older adults fall each year. Falls in the older persons are an important cause of injury, disability and death. About 5% of falls result in a fracture, and 5-10% of them result in other serious injuries requiring medical care. Even though intense research is going on in this area for a number of years, there is still no consensual agreement regarding the frequency of falls in the elderly, frequency of the nature of the falls, injury related to the fall and the factors predictive of falls. The high incidence of falls among older people and the subsequent high rates of potentially preventable morbidity and mortality highlight the need for early identification of risk factors.

Aim of the study

This study was done to describe the study population of elderly fallers who presented at the Emergency Department of the National University Hospital, Singapore; the consequences of their falls as well as to identify the predictors of falls.

Materials & Methods

The study was conducted in two parts. The first part was a retrospective study of 500 fallers in the year 2000. The data relevant to the study were collected from the computerised patient records of the Emergency Department, National

University Hospital, Singapore. The second part of the study involved conducting a case control study to identify possible predictors for falls in the elderly patients who were seen either at the Emergency Department of the National University Hospital, Singapore or at the Clementi Polyclinic. Cases were prospectively collected from the Emergency department of National University Hospital in May 2001. Controls were collected from the nearby Clementi polyclinic, which caters to the same catchment area. Assessment of functional impairment was done by Katz's index. Data was analysed by multiple logistic regression, using the statistical software, SPSS.

Results

The mean age of the study population was 79 years (retrospective study) and 72 years (case control study). Falls occurred mostly at home. Most fallers were females. Bony injuries predominated. Slips and trips accounted for 47% of the falls. Fracture of the femur was the commonest site of fracture. Increasing age (75 years and above) and functional impairment were found to be significant independent predictors of falls.

Conclusions

Since increasing age (75 years and above) and functional impairment are significant independent predictors of falls, we should pay more attention to people in these sub-groups in order to prevent them from falling and causing morbidity/mortality. Home is where most falls occurred which suggests that we should be looking at modifications to the existing home environment to make them safe from falls. We should also look at intrinsic factors and help maintain

stability of the persons prone to falling. This may be achieved with a structured exercise programme customised for different sub-groups of the elderly. Other intrinsic conditions may also demand attention in the elderly group who are more prone to falls. These include an assessment of cognitive, vision and hearing impairment among others. A further prospective study to take into account all these variables to have a more complete picture on the predictors of falls in the elderly in Singapore would be useful.

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CONFERENCE PRESENTATIONS

The findings of this research study were presented as a poster entitled "Falls in the Elderly in Singapore" in the 9th International Conference of International Medicine at Edinburgh, Scotland, from 17 – 21 June 2002.

** This poster attracted a lot of interest. Delegates asked about intervention strategies and what Singapore was doing for preventing falls.*

Another poster presentation entitled "An epidemiological study of Geriatric Falls in Singapore" was made at the 6th NUS – NUH Annual Scientific Meeting in Singapore from 16 – 17 Aug 2002.

** Contrary to the poster presented earlier in Edinburgh, this poster did not generate much interest. Perhaps, the significance of falls is still not important to people here, since the elderly population constitutes only 7.4% of the local population. However, the interest is going to be greater in the years to come as the size of the elderly population increases.*

INTRODUCTION

INTRODUCTION

Global Geriatric Scenario:

Half a century ago, most people in the world died before the age of 50. Today, the great majority survive well beyond that age, particularly in many industrialised countries. The World Health Organisation's 'World Health Report 1998' states that the global population aged 65 years is increasing by 750,000 a month. In 1995, 7% of the total global population (400 million) were aged 65 and above (1). By 2025, this will increase to 10% and there will be more than 800 million older people in the world. Two-thirds of them will be in developing countries, and a majority of them will be women.

Increases in the older population by up to 300% are expected in many developing countries, especially in Latin America and Asia, within the next 30 years. There will be 274 million people over the age of 60 years in China alone – more than the total present population of the United States. Although the population is ageing more slowly in industrialised countries, these countries will have relatively more people in the "old-old" bracket.

Women make up the majority of the older population in virtually all countries. This is largely because women live longer than men – an average of eight extra years in developed countries – and tend to marry men older than themselves.

In the next 25 years, the population aged 65 and above is likely to grow by 88% compared to an increase of 45% in the working-age population. This implies that a steadily declining number of people of productive age will have to provide for an expanding number of dependents, not merely in the form of direct support to older relatives but also through taxation, the provision of health and social services, and social security. Even in wealthy countries, most old and frail people cannot meet more than a small fraction of the costs of the health care they need. In the coming decades, few countries will be able to provide specialised care for their large population of aged individuals.

The Singapore Situation:

Elderly persons aged 65 and over increased to account for 7.4% of the resident population in 2001, up from 6.0% in 1990. The number and proportion of the old-old has also increased steadily over the years. According to the Singapore Census 2000 (2), there were some 16,000 residents who were aged 85 years and over in 1999. They formed just 0.5% of the total resident population. Compared with 1970, the size of the old-old population has increased by about 6 times.

The Prevalence of Falls:

Older people frequently fall. Falls have traditionally been recognised as one of the "giants" of geriatric medicine. Prospective studies have reported that 30% to 60% of community dwelling older adults fall each year (3, 4, 5, 6, 7, 8), with approximately half of them

experiencing multiple falls. The incidence rises steadily with age and tends to be highest among individuals 80 years of age and older. The prevalence of falls in Singapore among community dwelling elderly aged 60 and above is 17.2% (9).

The incidence among institutionalised elderly populations is considerably higher than that among community-dwelling elderly populations. In surveys of nursing home populations, the percentage of residents who fall each year ranges from 16% to 75%, with an overall mean of 43% (10, 11). A Singapore study showed that about 6% to 9% of elderly patients admitted to an acute geriatric ward may sustain a fall during their stay (12).

Falls in the older persons are an important cause of injury, disability and death. About 5% of falls result in a fracture, and 5-10% of them result in other serious injuries requiring medical care (8). Even in the absence of serious physical injury, falls may have severe psychological consequences leading to an accelerated decline in functional capacities. This is a serious public health problem, with a substantial impact on health and healthcare costs.

REVIEW OF THE LITERATURE

REVIEW OF THE LITERATURE

Literature review was done through a medline (pubmed) search using key words “elderly” and “falls”. It was restricted to English language articles only. To keep the review focused and current, articles published during the last 15 years only, were selected.

Historically, the blame for falling has, for the most part, been borne by the host, the person who falls. Popular mythology holds that falls are attributable to either individual carelessness or the process of aging. Falls are considered to be either a “normal” phenomenon of aging – a manifestation of a general decline bound to occur – or, in people with multiple disorders, one aspect of a “hopeless” state in which one disorder after another leads inevitably to a negative conclusion.

Contrary to popular myth, falls, to a large degree, rarely “just happen” – they are neither accidental nor random events – but are predictable occurrences, the outcome of a multitude of host related and environment factors that occur either alone or in conjunction with one another. Many of the factors that contribute to falls are potentially amenable to interventions. By minimising or eliminating these risk factors, falls can be reduced or prevented altogether.

Predictors of falls in community dwellers

In a prospective study of 1159 persons aged 70 years or over by Luukinen et al (5), the fall prevalence rate was found to be 30%. Falls increased with advancing age and women had a greater risk of falling than men. Most falls occurred in the daytime and at home.

Nevitt et al (7) in their prospective study on falls in 325 community dwelling persons aged 60 years or older who had fallen during the previous year, found that risk factors for having a single fall were few and relatively weak, but multiple falls were more predictable. In multivariate analysis, they found increased odds of two or more falls for persons who had difficulty standing up from a chair, difficulty performing a tandem walk, arthritis, Parkinson's disease, three or more falls during the previous year, and a fall with injury during the previous year, and for whites. The proportion of subjects with two or more falls per year increased from 0.10 for those with none or one of these risk factors to 0.69 for those with four or more risk factors.

Chan et al (9) in their study on 401 elderly community dwellers in Singapore, aged 60 and above, found a fall prevalence rate of 17.2%. Women had twice the rate of falling as men. Most falls occurred outdoors and in the daytime. The significant predictors of falls were age (75 years and above), female gender, Malay ethnicity, poor vision, functional impairment, medication history (history of taking 2 or more drugs daily) and presence of hypertension.

Hale et al (13), in their prospective study on 120 ambulatory geriatric outpatients, found a 36% fall prevalence rate. Two thirds of the falls occurred in or around the subject's home. More trips were recorded. Bony injuries were less than soft tissue injuries and the knee was the commonest anatomical location of the injury. However, function impairment or use of medications was not significantly associated with falls in this study.

Tromp et al (14) conducted a prospective study of falls among 1285 community dwelling elderly. Previous falls, visual impairment, urinary incontinence and use of benzodiazepines were the strongest predictors identified in the risk profile model for any falls whereas previous falls, visual impairment, urinary incontinence and functional limitations proved to be the strongest predictors in the model for recurrent falls.

Graafmans et al (15) also conducted a prospective study of 354 community dwelling elderly subjects aged 70 years or over. Fall rate was found to be 36%. Mobility impairment and dizziness upon standing was associated with falls and strongly associated with recurrent falls. However, history of stroke, poor mental state and postural hypotension was associated with recurrent falls only.

A very high rate of 53.5% falls were reported in a two year prospective study of 482 community dwelling elderly adults over 60 years of age, by Vellas et al (16). Women had higher fall rates than men. Age, history of fracture, low physical health, and low or high mobility level were risk factors for injurious falls in both sexes. The inability to balance unsupported on one leg was associated with injurious falls in women only.

In a prospective study by Cumming et al (17) of 1358 elderly people aged 65 years and above, living in the community, 27% of subjects reported at least one fall in the previous year and 8% reported 2 or more falls. After adjusting for potential confounders (including age, sex, relevant medical conditions, health status, cognitive impairment, use of alcohol, depression and use of other medications), the following medications were found to be important risk factors for multiple falls: diazepam, diltiazem, diuretics and laxatives.

In a survey by Wickham et al (18), 983 elderly people were queried about falls they had in the past. Those who had fallen one or more times had reduced grip strength and were less mobile then those who had not fallen. More of them used non-phenothiazine tranquillisers, lived alone, had recently lost weight or were physically disabled. Independent of these influences, a history of having fallen was strongly related to place of residence. Part of this relationship was explained by differences in housing, in particular the percentage of houses without indoor lavatories.

Northridge et al (19) in their one year prospective study on 266 females and 59 males who had an episode of fall at least once before the onset of study found that frail individuals were more prone to fall as compared to vigorous individuals. They also found that falls were not strongly associated with the presence of home hazards.

Sattin et al (20) in their study found that rate of fall injury events coming to acute medical attention increased exponentially with age for both elderly men and women (predominantly white). Almost half of all fall injury events occurred at home. Fall injury events were

associated with underlying medical conditions. Compared with males, females had a higher incidence of fractures other than skull. Males were twice as likely to die from fall related injuries as compared to females. Moreover, 42% fall injury events resulted in hospital admission. In their study they also found that the mean length of stay of the fallers in the hospital was 11.6 days.

Vellas et al (21) in their study of 487 elderly subjects aged 60 years and over, found a 55% fall rate. 32 % of subjects who experienced a fall reported a fear of falling and women were more likely to report fear of falling. Gait abnormalities, poor self perception of physical health and cognitive impairment were significantly associated with falls.

In a study on 100 volunteers aged 62-96 by Maki et al (22), lateral spontaneous-sway amplitude (blindfolded conditions) or control of lateral stability, was found to be the single best predictor for future falling risk.

According to Dr.Tideiksaar (23), falling itself is not a diagnosis but a symptom of multiple underlying diseases, the effect of certain medications on homeostasis, and/or environmental hazards or obstacles that interfere with safe mobility. Specific preventive strategies include treating underlying medical conditions, prescribing an exercise programme to improve mobility, removing fall hazards in the home, and taking steps to minimise the fear of falling.

Evaluating recurrent falls in ambulatory frail elderly, Lipsitz et al (24) studied 70 recurrent fallers and 56 non fallers. 23% falls resulted in minor injuries while 3% resulted in fractures. Fallers were more often women, were functionally more impaired, and were taking more medications than non fallers. Stroke, Parkinsonism, visual impairment with or without dizziness, drug induced hypotension and severe arthritis were the most common causes of falls.

In a cross-sectional analyses of report of falls in the previous one year by well-functioning elderly aged 70 to 79 years living in the community, De Rekeneire et al (25) found that almost one quarter of women and 18.3% of men reported at least one fall. Fallers were more likely to be female; white; report more chronic diseases and medications; and have lower leg strength, poorer balance, slower 400-meter walk time, and lower muscle mass. In men, multivariate logistic regression models showed white race, slower 6-meter walk speed, poor standing balance, inability to do 5 chair stands, report of urinary continence, and mid quintile of leg muscle strength to be independently associated with report of falling. In women, benzodiazepine use, and reported difficulty in rising from a chair were associated with falls.

Davis et al (26) did a prospective cohort study on risk factors of falls and for serious injuries on falling among older Japanese women (mean age 74 years) in Hawaii. In multivariate models, they found 4 subject characteristics to be positively associated with having a fall – having a fall in the previous 1 year, slow chair stands, a short height and difficulties with 5 or more ADLs. Two subject characteristics were negatively associated

with having a fall – ability to perform a full tandem balance with eyes closed, and having a long functional reach. In addition, long times for chair stands and a low BMI were positively associated with having a serious injury among women who had a fall. Among the same women, taking part in an activity they did frequently and slow foot reaction times, were associated negatively with having a serious injury.

In an analysis of prospective fall reports in 124 women with confirmed stroke over 1 year, Lamb et al (27) found frequent balance problems while dressing were the strongest risk factor for falls. Residual balance, dizziness or spinning stroke symptoms were also a strong risk factor for falling. Residual motor symptoms were not associated with an increased risk of falling.

Tinetti et al (28) in their study of 1103 community-living persons aged 72 years and older, found a fall rate of 49%. The factors independently associated with experiencing a serious injury during a fall included cognitive impairment, presence of at least 2 chronic conditions, balance and gait impairment and low body mass index. In a separate analysis, female gender as well as most of the above factors, were associated with experiencing a fall injury.

In another study by Tinetti et al (29) of 568 community-living persons aged 72 years and older, 12% of fallers suffered a serious injury during their first reported fall. No acute host factor was associated with increased risk of injury. The environment and activity factors associated independently with serious injury in multivariate analysis included falling on stairs, during displacing activity, and from at least body height. The independent

predisposing factors included female gender, low body mass index and cognitive impairment.

Liu et al (30) did a prospective cohort study of 100 older volunteers (mean age 83) who were independent in activities of daily living and able to stand unaided. 59% of subjects fell at least once during the 1-year follow up. Antidepressant use was associated with an increase in the risk of experiencing one or more falls. The use of other drug classes examined, including diuretics and sedative-hypnotics, was not associated with an increased risk of falling. Orthostatic hypotension was not predictive of falls.

Luukinen et al (31) also did a prospective study of 1016 home-dwelling elderly persons aged 70 years or older, for recurrent falls. 6% of the men and 14% of the women had recurrent falls. Logistic regression analysis showed female sex, urinary urgency, frequent fear of falling, dizziness, a poor pulse rate rise 30 seconds after standing up and falling during the previous year to be risk factors for recurrent falls.

In a prospective study of 465 elderly aged 70 years and over, Campbell et al (32) found women had a significantly increased relative risk of falling as compared to men. 32.7% of women and 23% of men experienced at least one fall in which there was no or minimal external contribution. Controlling for the variables age, use of psychotropic drugs, inability to rise from a chair without using arms, going outdoors less than daily and living alone decreased the relative risk of women falling compared to men from 2.02 to 1.55.

In another prospective study of 761 subjects 70 years and older by Campbell et al (33), variables associated with an increased risk of falling differed in men and women. In men, decreased levels of physical activity, stroke, arthritis of the knees, impairment of gait and increased body sway were associated with an increased risk of falls. In women, the total number of drugs, psychotropic drugs and drugs liable to cause postural hypotension, standing systolic blood pressure of less than 110 mm Hg, and evidence of muscle weakness were also associated with an increased risk of falling.

Predictors of falls in the hospital setting

Lieu et al (12) did a 3 year study on falls in a geriatric ward in a local Singapore hospital. The fall rate was found to be 9%. About 85.7% of falls occurred at the bedside and 41.4% happened while getting in and out of bed. Most falls occurred between 4 pm and 8 pm and half of the fallers had no preceding symptoms.

In a retrospective analysis of patient falls, Morse et al (34) analysed 744 falls during one year in a hospital. The incidence of falls was approximately 2.3 for 100 patient bed-days; 27.3% were from beds, 18.2% were from a chair, wheel chair or commode. More than 40% of the patients who fell had a primary diagnosis of trauma or diseases of the nervous system. Cardiovascular disease was most frequently the secondary diagnosis. Most patients who fell had received medication within one hour of the incident; central nervous system drugs were the largest category of drugs. In addition, most patients who fell (70%) did not

suffer injury. However, 26.5% sustained minor injury and 3.6% sustained a concussion or fracture.

Consequences of falls

In a prospective study by Berg et al (3) of 96 community dwelling elders, the fall rate was found to be 51%. Trips and slips were the most prevalent causes of falls, accounting for 59%. Falls more often occurred during the afternoons and while subjects walked on level or uneven surfaces. The fracture rate was 5% while the soft tissue injury rate was 9%. Falls by men most often resulted from slips whereas falls by women most often resulted from trips. Men fell more often during winter while women fell more often during summer.

In a study by Campbell et al (4) on falls experienced by 761 community subjects aged 70 years and above, the fall rate was found to be 47% for those aged 70-74 years and 21% for those 80 years and over. There was no sex difference in fall rate but men were more likely than women to fall outside and at greater levels of activity. 20% of the falls were associated with slips and trips and 10% falls resulted in significant injury. Men who fell had an increased subsequent risk of death compared with those who did not fall.

According to Tinetti et al (35), 30% of elderly persons living in the community and over 50% of those living in institutions fall each year. These falls may result in death, fracture, other serious injuries, self-imposed restriction of activity, discouragement from care providers and even institutionalisation. Most falls appear to result from the cumulative

effects of factors intrinsic to the patient, factors related to the activity engaged in at the time, and environmental factors.

Alexander et al (36) in their study found that fall-related trauma accounted for 5.3% of all hospitalisation of older adults. Persons admitted with falls were more frequently female and tended to be older. Fallers requiring hospitalisation were discharged more to nursing homes than their own homes.

Luukinen et al (37) conducted a cohort study of 980 home dwelling persons aged 70 years or older. The overall incidence of falls was 500 per 1000 person-years. Indoor falls and fractures were more common than those occurring outdoors. Women were more prone to sustain a fracture after a fall than men. More slips were recorded outdoors and majority of hip fractures occurred indoors.

In a population survey of 1660 elderly persons of 70 years and over, by Stalenhoef et al (38), falls in the previous year were reported by 44%: one-off falls by 25% and recurrent falls by 19%. Women had significantly more falls than men. Major injury was reported by 8% of the fallers; minor injury by 49%. Treatment of injuries was by the GP in 67% of the cases.

Nevitt et al (39) in their prospective study of 325 elderly community-dwelling persons who had fallen in the previous year, found 6% of falls resulted in a major injury (fracture, dislocation or laceration requiring suture while 55% resulted in a minor soft tissue injury.

The risk of injury per fall was about the same regardless of the number of falls a person had during follow-up. The risk of major injury was increased in falls associated with loss of consciousness compared to nonsyncopal falls. In multivariate analysis of nonsyncopal falls, the risk of major injury per fall was higher in persons having a previous fall with fracture, a slower Trail Making B time, and in Whites. The risk that a nonsyncopal fall would result in minor injury (versus no injury) was increased in persons with a slower hand reaction time, decreased grip strength, in Whites, in falls while using stairs and steps, and turning around and reaching.

Randomised trials

In a randomised controlled trial of 693 elderly patients, aged 65 years and older, by Close et al (40), the primary attributable cause relating to a fall was frequently related to an environmental hazard. However, many patients had multiple risk factors. These findings highlight the dynamic interaction between intrinsic and extrinsic risk factors in relation to a fall.

In a randomised factorial trial of falls prevention by Day et al (41) among older people aged 70 years and over living in their own homes, improved balance reduced falls which were further reduced by the addition of home hazard management or reduced vision management. Thus, gait and balance problems, impaired vision and presence of home hazards contributed significantly to falls.

Summary of the Literature Review:

The high incidence of falls among older people and the subsequent high rates of potentially preventable morbidity and mortality highlight the need for early identification of risk factors. After reviewing some of the research studies on falls in the elderly, we can conclude that even though intense research is going on in this area for a number of years, there is still no consensual agreement regarding the frequency of falls in the elderly, frequency of the nature of the falls, injury related to the fall and the factors predictive of falls, e.g. Chan et al in their study (9) found that females were more fallers as compared with males whereas Campbell et al (4) in their study did not find gender difference to be significantly related to fall.

Again, Chan et al (9) in their study found functional impairment and medication history to be significant correlates of fall whereas Hale et al (14) in their study did not find functional impairment and medication history to be significantly related to fall. There is also no consensual agreement regarding the timing of the episode of the fall, e.g. Lieu et al (12) in their study found more incidence of falls in the evening (4pm to 8pm) whereas Berg et al (3) found more incidence of falls in the afternoon.

In addition, there is a paucity of information when one looks at the literature regarding falls in Singapore, especially information regarding the predictors or significant correlates of fall.

Our study looks towards addressing the above issues in relation to falls in the elderly in Singapore.

AIM OF THE STUDY

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This study was done to describe the study population of elderly fallers who presented at the Emergency Department of the National University Hospital, Singapore; the consequences of their falls as well as to identify the predictors of falls.

MATERIALS & METHODS

MATERIALS & METHODS

Study Design: This study was conducted over two parts in different time periods.

(a) Retrospective study

(b) Case control study

Study Setting: (a) Retrospective - Emergency Department, National University Hospital, Singapore.

(b) Case control - Emergency Department, National University Hospital, Singapore & Clementi Polyclinic.

Study Population:

(a) ***Retrospective part:***

The study population for the retrospective part of the research were all fallers and information on the following variables of the study population was sought.

1. Patient Characteristics (Demography) – *age/gender/race*
2. Place of Fall – *home, outside*
3. Nature of Fall – *slip, trip, others, no recollection*
4. Co-morbid conditions – *0, 1, 2, more than 2 comorbid conditions*
5. Reported Site of Injury – *head & neck, trunk & abdomen, upper limbs, lower limbs*
6. Type of Injury – *bony, soft tissue*
7. Site of Fracture – *femur, pelvis, humerus, Colles, others.*

(b) Case Control:

The study population for the case control part of the study were fallers (cases) as well as non-fallers (controls) and information on the following variables of the study population was sought.

1. Patient Characteristics (Demography) – *age/gender/race*
2. Place of Fall – *home, outside*
3. Nature of Fall – *slip, trip, others, no recollection*
4. Reported Site of Injury – *head & neck, trunk & abdomen, upper limbs, lower limbs.*
5. Type of Injury – *bony, soft tissue*
6. Site of Fracture – *femur, pelvis, humerus, Colles, others*
7. Co-morbid conditions – *0, 1, 2, more than 2 comorbid conditions*
8. Drug History – *no medication, medication with no sedative effect, medication with sedative effect*
9. Functional Impairment (ADL Status) –*ADL-independent, ADL-dependent*

Methodology:

The study was conducted in two parts. The first part involved retrospectively collecting data relevant to the study, from the computerised patient records at the Emergency Department of the National University Hospital, Singapore. This gave us a background picture of the fall scenario amongst elderly patients seen there, regarding prevalence of falls and its health

consequences. The collected data was entered into a structured protocol sheet (case entry form). This case entry form (appendix I) was initially piloted on a sample of 20 patient records. It was reviewed by the supervisors and necessary corrections/modifications were made. The data was then uploaded into a computerised database, tabulated and analysed using SPSS for Windows (version 11).

The second part of the study involved conducting a case control study to identify possible predictors for falls in the elderly patients who were seen either at the Emergency Department of the National University Hospital, Singapore or at the Clementi Polyclinic. Cases were prospectively collected from the Emergency department of National University Hospital in May 2001. Controls were collected from the nearby Clementi polyclinic, which caters to the same catchment area. The routine history relating to the fall was obtained from the patient and supplemented from the caregiver and entered into the structured protocol sheet (case entry form). The patients and/or their caregivers were also asked for information about the functional (ADL or activities of daily living) status of the patient. This was done with the help of the Katz index, at the time of admission to the Emergency or polyclinic by the principal investigator and the research assistant. Data collected was entered into a computerised database, tabulated and analysed by multiple logistic regression. Software used was SPSS for Windows (version 11).

Definitions:

Fall: A sudden, often unexplained change in position in which an adult patient comes to rest unintentionally on the floor.

Case: A case was defined as any elderly person (60 years and above), seen at the Emergency department of National University Hospital in May 2001, with a presenting complaint of fall.

Control: A control was defined as any elderly person (60 years and above) seen at the Clementi polyclinic, without a presenting complaint of fall.

Elderly: An elderly person was one who was 60 years or older.

Young-old: Persons belonging to the age group 60-74 years.

Middle-old: Persons belonging to the age-group 75-84 years.

Old-old: Persons who are 85 years or older.

Ethnicity (Race): Study participants were classified according to their ethnicity (race) into Chinese, Malays, Indians and others.

Place of fall: Place of fall refers to whether the person fell in his/her home or outside the home.

Nature of fall: Nature of fall refers to whether the fall was due to a slip, a trip, other mechanisms or the patient had no recollection of how he/she fell.

Comorbid Conditions: A comorbid condition was defined as any chronic medical condition existing in the study subjects (eg: heart disease, diabetes, etc).

Reported site of injury: Site of injury refers to the area of the body affected by the fall. It was divided into 4 zones: head and neck, trunk and abdomen, upper limb and lower limb.

Type of injury: Type of injury denotes whether the fall caused a bony or soft tissue injury.

Site of fracture: The fracture site was classified into 5 categories: fracture of the femur, fracture of the pelvis, fracture of the humerus, Colles fracture and others.

Drug History: Patients were classified into 3 categories according to their drug history: on no medication; on medication with no sedative effect; and on medication with sedative effect.

Functional Impairment (activities of daily living or ADL status): A patient was classified functionally impaired according to his ADL score. A score of 5 and above meant ADL-

independent or no functional impairment while a score of 4 and below meant ADL-dependent or functionally impaired.

Katz index: It is a validated instrument to assess functional status of a patient as a measurement of the patient's ability to perform activities of daily living independently. The index ranks adequacy of performance in the six functions of *bathing, dressing, toileting, transferring, continence, and feeding.* Clients are scored yes/no for independence in each of the six functions. 'Yes' constitutes a score of 1 and 'no' constitutes a score of 0. A score of 6 indicates full function, 4 indicates moderate impairment, and 2 or less indicates severe functional impairment. In our study, an ADL-independent patient was one who had a Katz index score of 5 or 6. An ADL-dependent patient was one who had a score of 4 or less.

Caregiver: Caregiver refers to the person(s) accompanying the patient and knowledgeable about the patient's condition.

RESULTS

RESULTS

Retrospective Study

1. Description of the Study Population

Socio-demographic variables

1.1 Age:

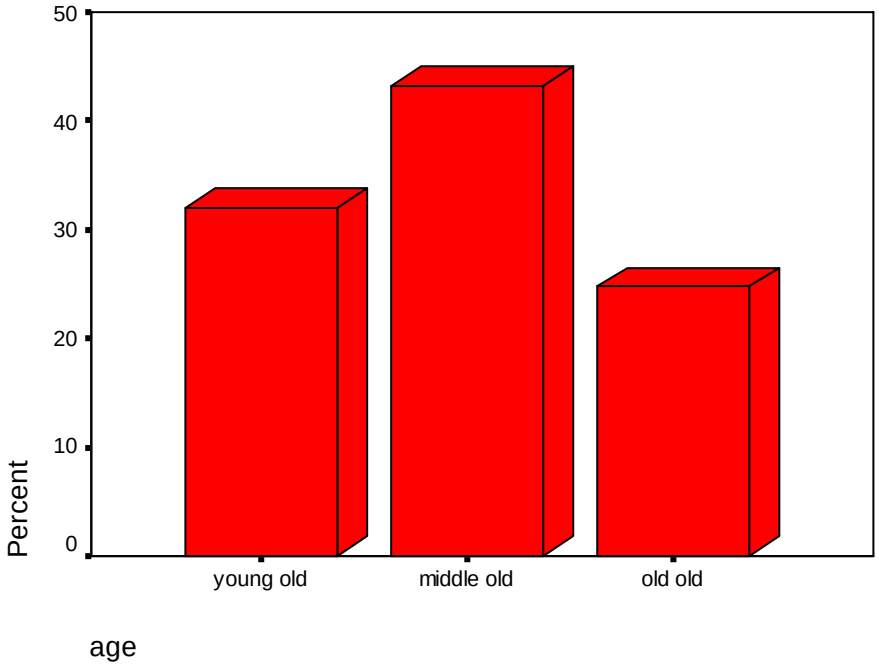
The study population of 500 faller patients ranged from 60 to 107 years of age. The mean age was 79 years with a standard deviation of 7.97.

More number of fallers were found in the middle-old group as compared to the young-old or old-old group (43.3% versus 32% and 24.7% respectively).

Table 1.1: Age-group of Fallers

Young Old (60-74 years)	160 (32%)
Middle Old (75-84 years)	216 (43.3%)
Old Old (85 years and above)	124 (24.7%)

Fig 1.1: Age-group of Fallers



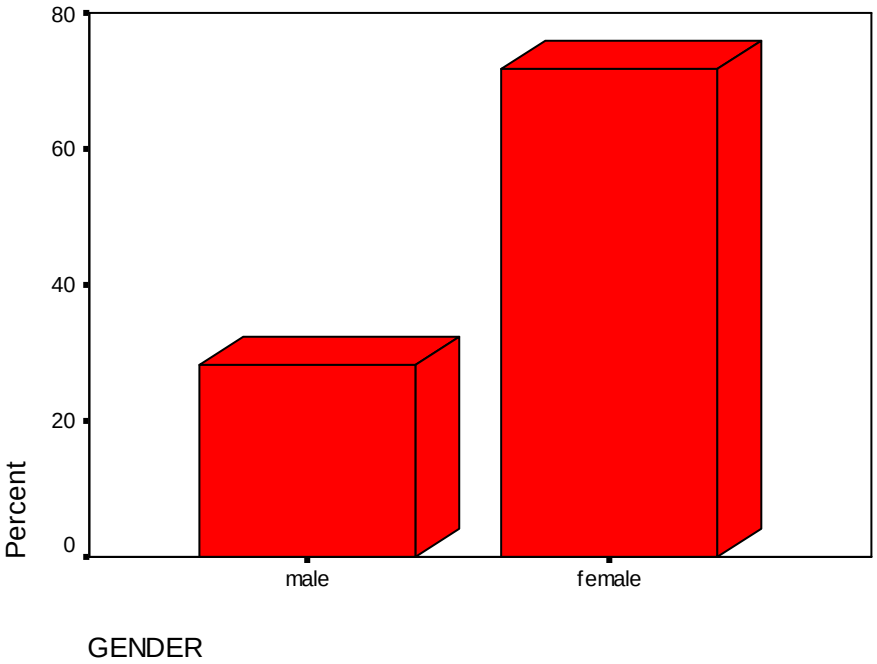
1.2 Gender:

Most fallers were females.

Table 1.2: Gender of Fallers

Males	142 (28.3%)
Females	358 (71.7%)

Fig 1.2: Gender of Fallers



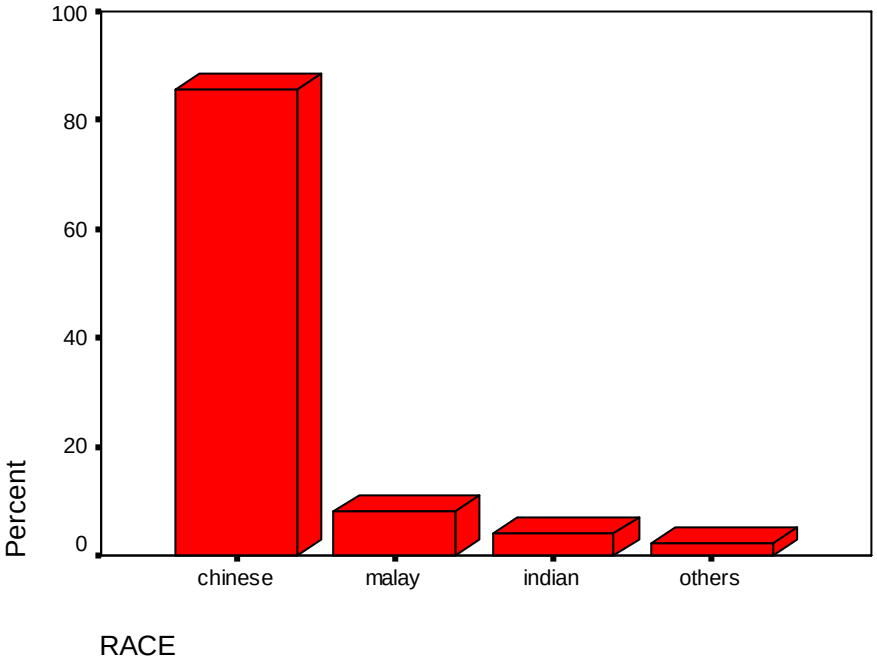
1.3. Ethnicity:

Most fallers were of Chinese ethnicity followed by Malays, Indians and others.

Table 1.3: Ethnicity of Fallers

Chinese	428 (85.6%)
Malays	40 (8%)
Indians	21 (4.2%)
Others	11 (2.2%)

Fig 1.3: Ethnicity (race) of Fallers



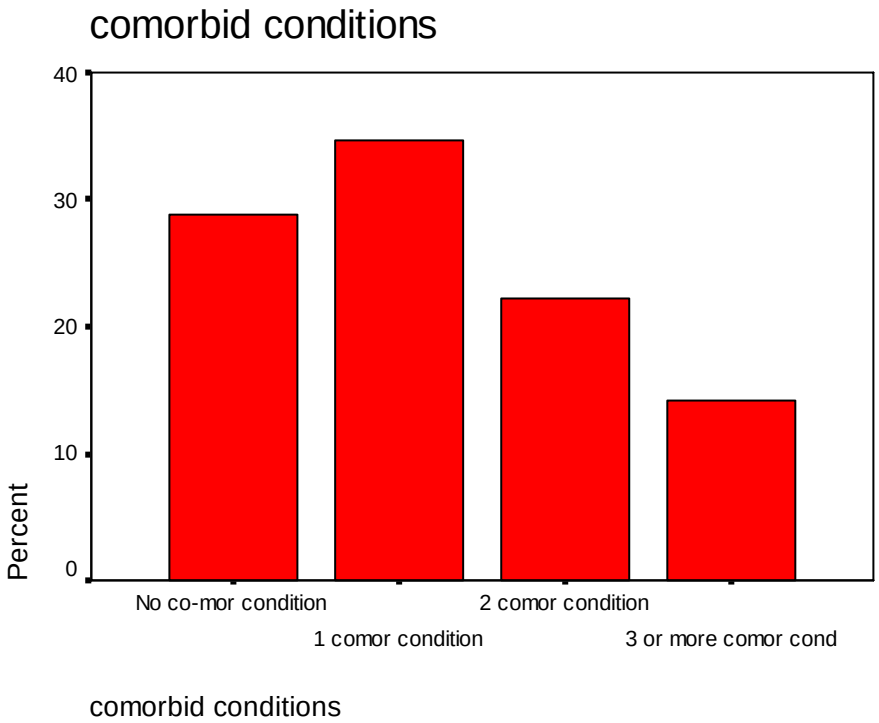
Clinical Variables

1.4. Fallers with comorbid conditions:

Majority of the fallers had 1 comorbid condition.

Table 1.4: Fallers with comorbid conditions

No comorbid conditions	144 (28.9%)
1 comorbid conditions	173 (34.7%)
2 comorbid conditions	111 (22.2%)
3 or more comorbid conditions	71 (14.2%)



Description of the fall

1.5. Place of fall:

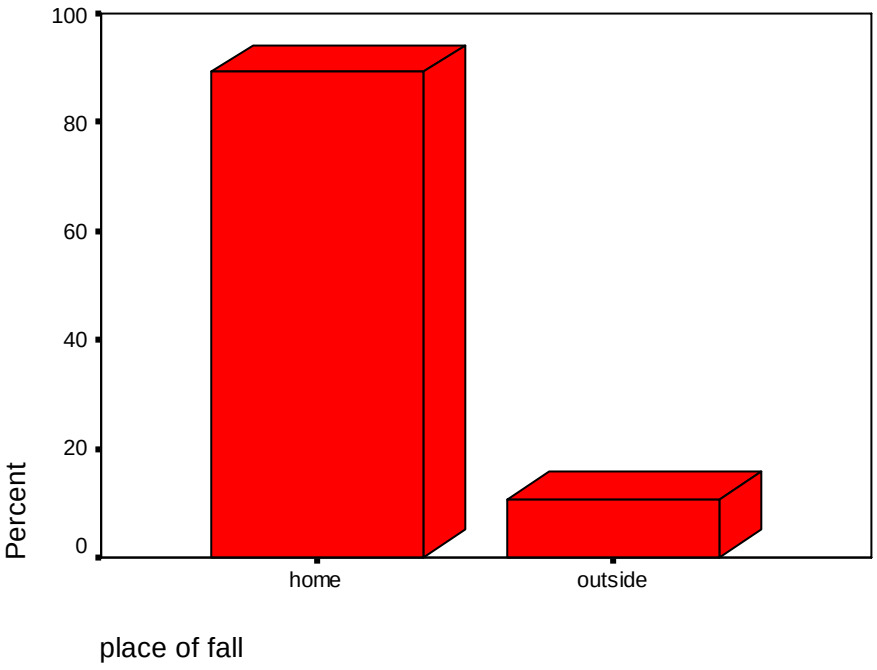
Most of the falls (84.6%) occurred in the homes of the fallers.

Table 1.5: Place of Fall

Home	423 (84.6%)
Outside	51 (10.2%)

* Missing data = 26

Fig 1.5: Place of fall



1.6. Nature of Fall:

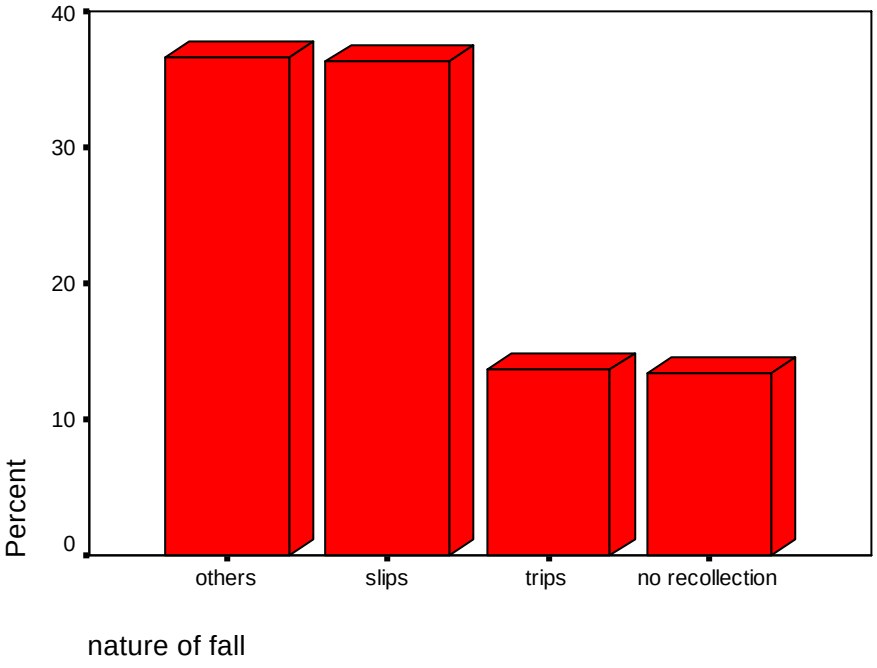
Most of the falls (47%) were due to slips and trips.

Table1.6: Nature of Falls

Slips	171 (34.2%)
Trips	64 (12.8%)
Others	172 (34.4%)
No recollection	63 (12.6%)

* Missing data = 30

Fig 1.6: Nature of fall



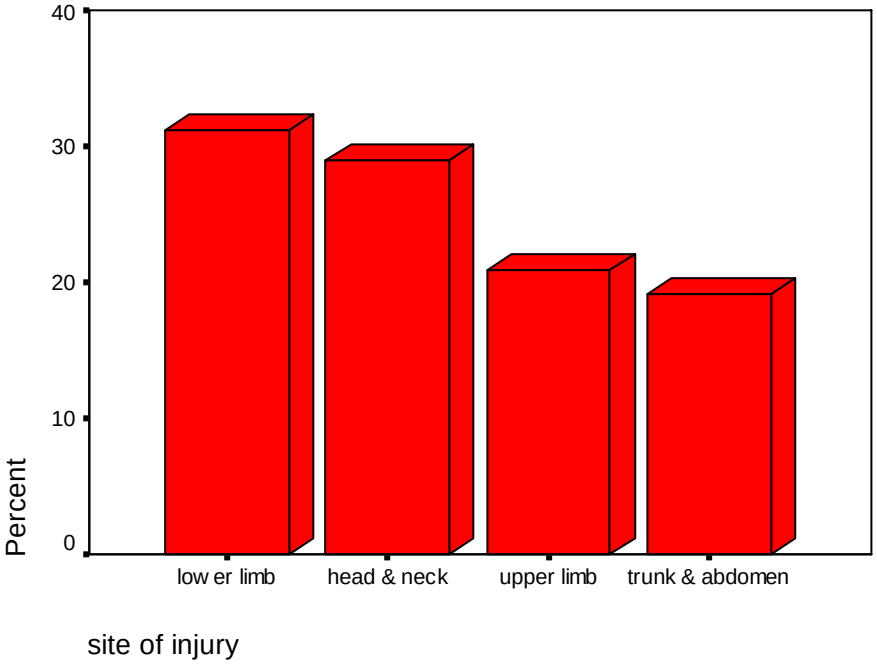
1.7. Site of Injury:

Most fallers had lower limb injuries followed by head & neck injuries.

Table 1.7: Site of Injury in fallers

Head & Neck	145 (28.9%)
Trunk & Abdomen	95 (19.1%)
Upper Limb	105 (20.9%)
Lower Limb	155 (31.1%)

Fig 1.7: Site of injury



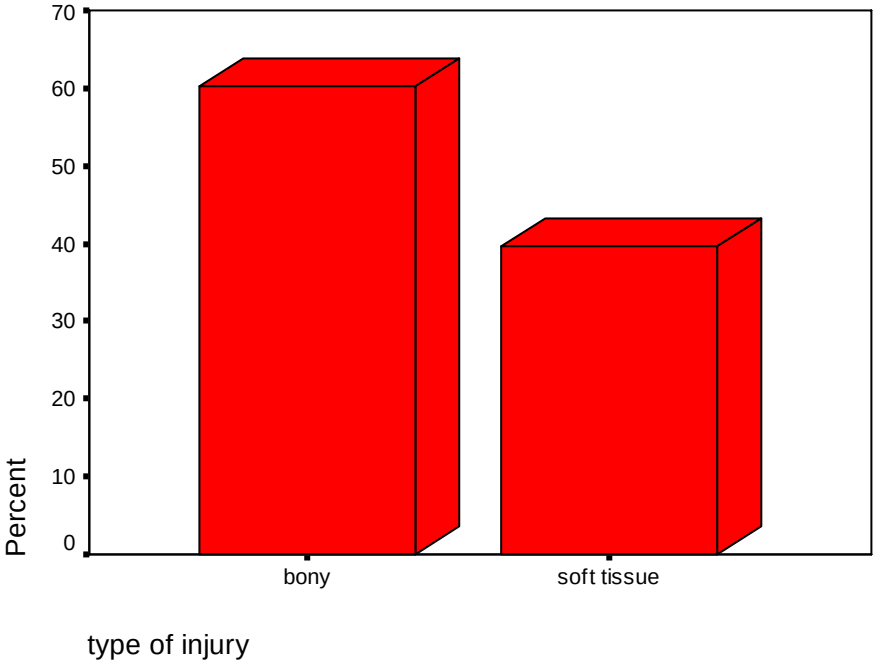
1.8. Type of Injury:

Fallers had more bony injuries than soft tissue injuries.

Table 1.8: Type of injury in fallers

Bony	302 (60.3%)
Soft Tissue	198 (39.7%)

Fig 1.8: Type of injury



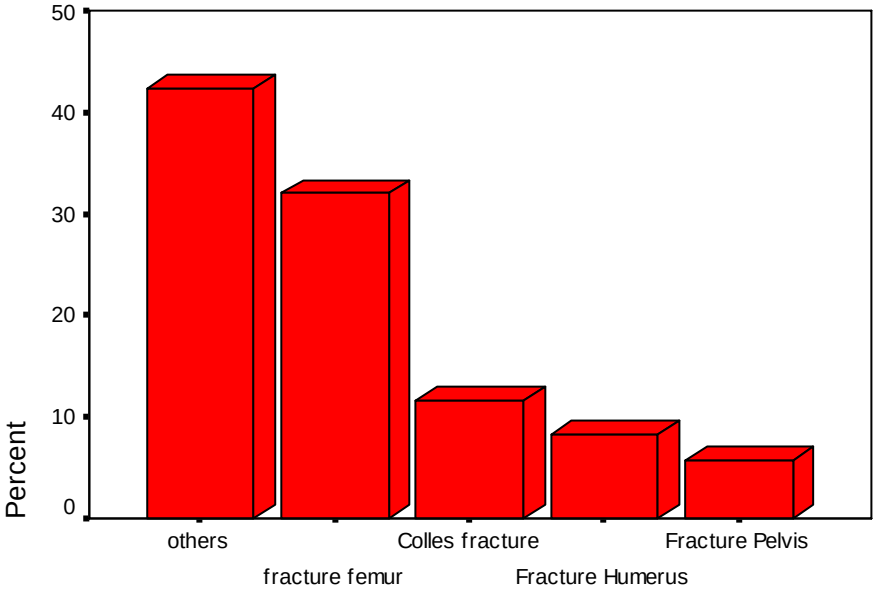
1.9. Site of Fracture:

Fracture of the femur was the commonest site of fracture followed by Colles fracture.

Table 1.9: Site of Fracture in fallers

Fracture Femur	97 (31.9%)
Fracture Pelvis	17 (5.6%)
Fracture Humerus	25 (8.2%)
Colles Fracture	35 (11.5%)
Others	130 (42.8%)

Fig 1.9: Site of Fracture



2. Relationship between different variables using chi-square tests, keeping level of significance at 0.05

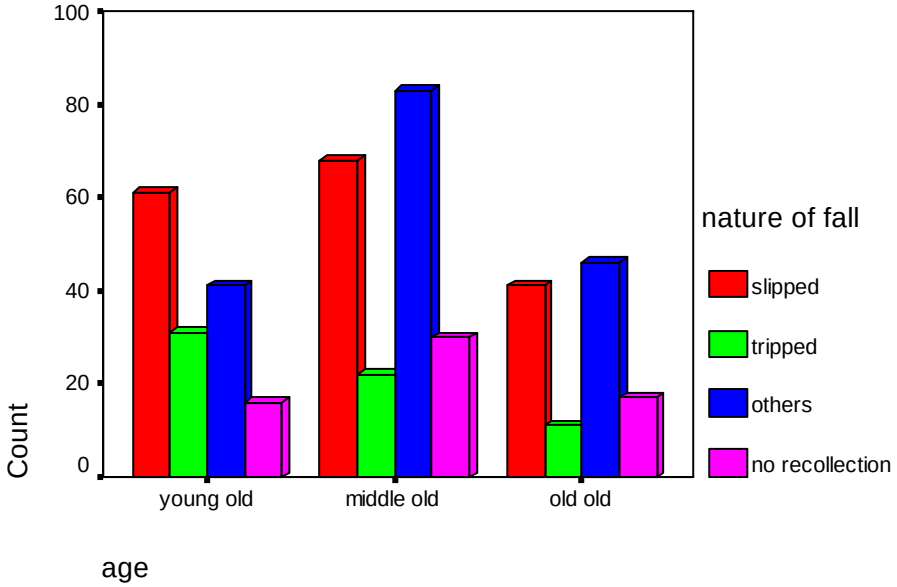
2.1 Age-group & nature of fall:

The predominant nature of falls varies with the age group. In the middle-old and old-old, intrinsic factors or mechanisms other than slips and trips accounted for 40% of the falls. In the young-old, 62% of the falls were due to extrinsic factors or falls due to slips and trips.

Table2.1: Relationship between age-group & nature of fall

Age-group	**Nature of fall**				**Sig**
	Slips	Trips	Others	No recollection	
Young Old	61(40.9%)	31(20.8%)	41(27.5%)	16(10.7%)	0.02
Middle Old	68(33.5%)	22(10.8%)	83(40.9%)	30(14.8%)	
Old Old	41(35.7%)	11(9.6%)	46(40.0%)	17(14.8%)	

Fig 2.1: Relationship between age-group & nature of fall



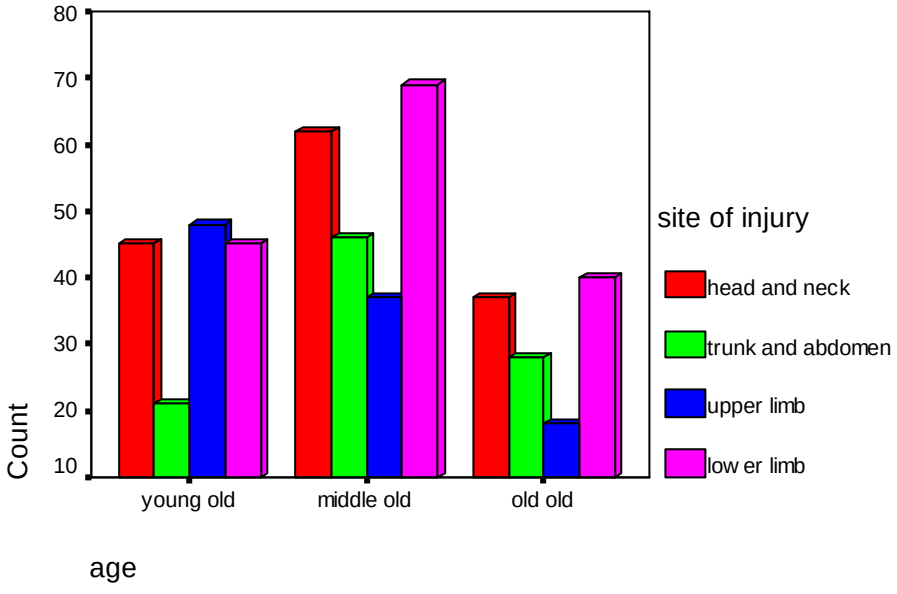
2.2 Age-group & site of injury:

Increasing trends are observed as the elderly ages in lower limb injuries, head & neck injuries as well as trunk & abdomen injuries. However, there is a decreasing trend in upper limb injuries as the elderly ages. Fallers in the young-old category had more upper limb injuries while the middle-old and old-old groups had more lower limb injuries.

Table2.2: Relationship between age-group & site of injury

Age-group	Site of injury				Sig
	Head & Neck	Trunk & Abdomen	Upper limb	Lower Limb	
Young Old	45(28.3%)	21(13.2%)	48(30.2%)	45(28.3%)	0.02
Middle Old	62(29.0%)	46(21.5%)	37(17.3%)	69(32.2%)	
Old Old	37(30.1%)	28(22.8%)	18(14.6%)	40(32.5%)	

Fig 2.2: Relationship between age-group & site of injury



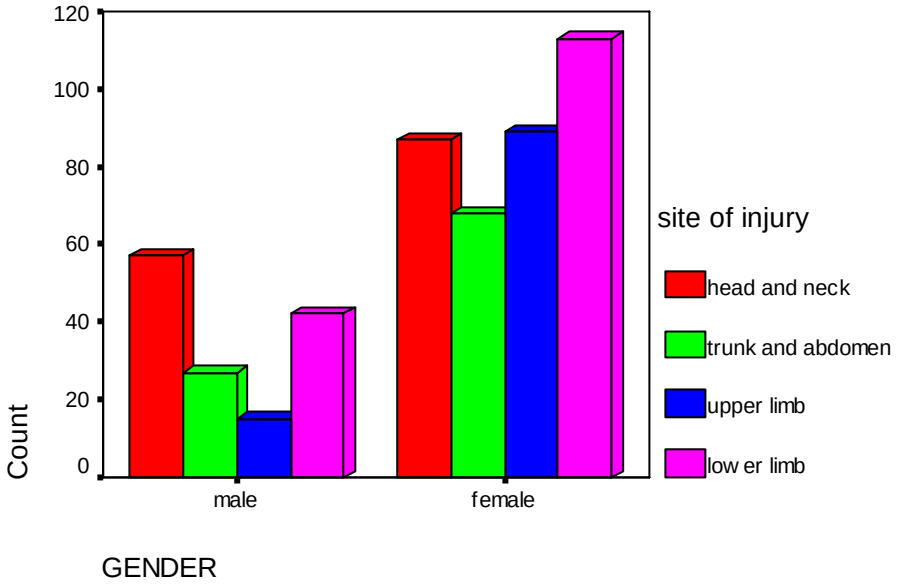
2.3 Gender & site of injury:

Males had more head & neck injuries followed by lower limb injuries. On the other hand, females had more lower limb injuries followed by upper limb injuries.

Table2.3: Relationship between gender & site of injury

Gender	Site of injury				Sig
	Head & Neck	Trunk & Abdomen	Upper limb	Lower Limb	
Male	57(40.5%)	27(19.1%)	15(10.6%)	42(29.8%)	0.00
Female	87(24.4%)	68(19.0%)	89(24.9%)	113(31.7%)	

Fig 2.3: Relationship between gender & site of injury



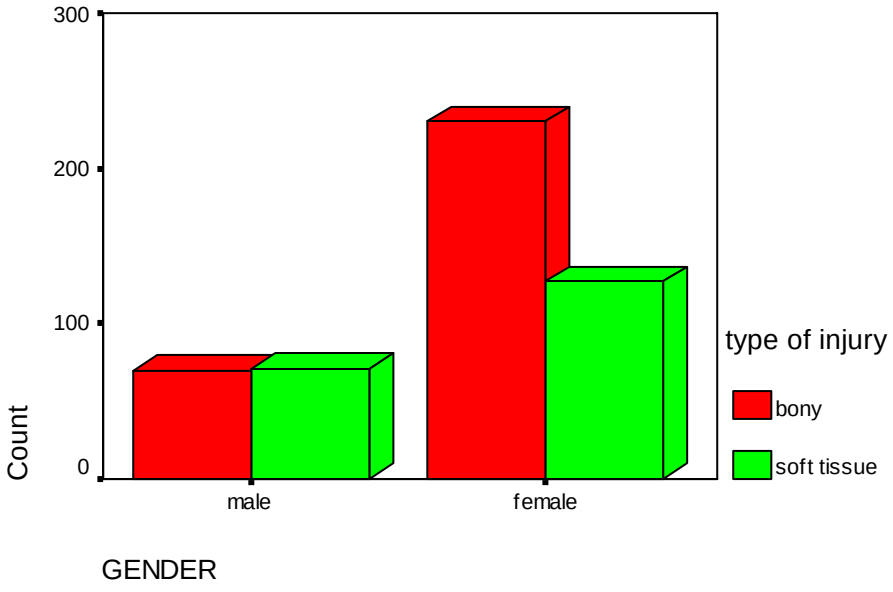
2.4 Gender & type of injury:

Female fallers were more likely to have bony injuries. The ratio between soft tissue and bony injuries was about 1:2. However, in the males, the distribution between soft tissue and bony injuries is almost similar.

Table 2.4: Relationship between gender & type of injury

	Type of injury		
Gender	Bony	Soft	**Sig**
Male	70 (49.6%)	71 (50.4%)	0.00
Female	230 (64.4%)	127 (35.6%)	

Fig 2.4: Relationship between gender & type of injury



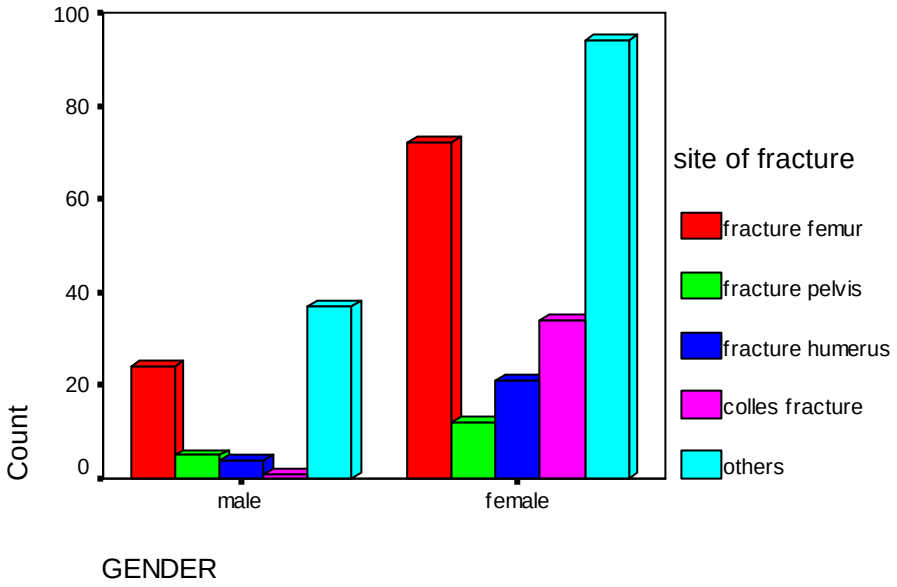
2.5 Gender & site of fracture:

Fracture of the femur was the commonest site of fracture in both males and females. After that, more male fallers had fracture of the pelvis while more female fallers had Colles fracture.

Table2.5: Relationship between gender & site of fracture

Gender	Site of fracture					Sig
	Fracture Femur	Fracture Pelvis	Fracture Humerus	Colles Fracture	Others	
Male	24(33.8%)	5(7.0%)	4(5.6%)	1(1.4%)	37(52.1%)	0.04
Female	72(30.9%)	12(5.2%)	21(9.0%)	34(14.6%)	93(39.9%)	

Fig 2.5: Relationship between gender & site of fracture



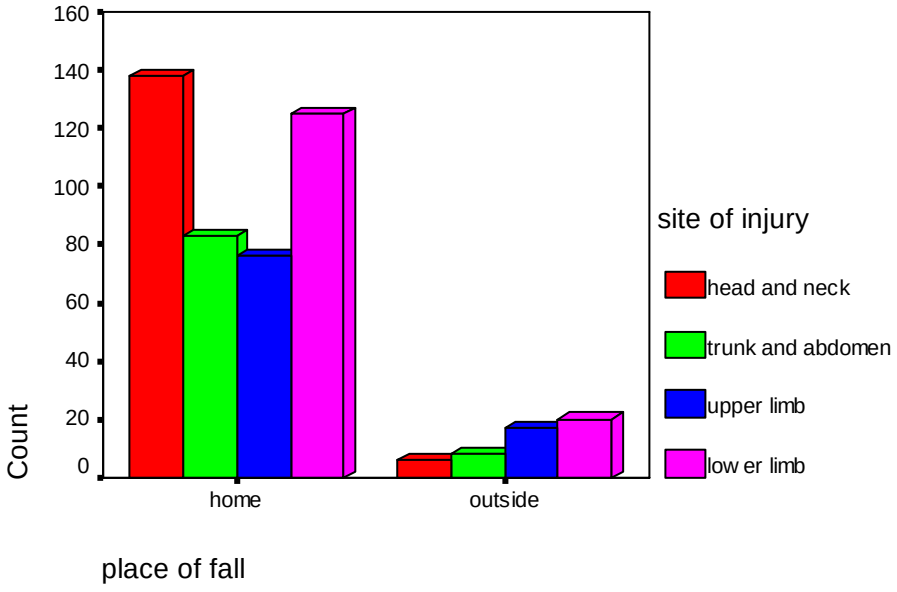
2.6 Place of fall & site of injury:

Head & neck region was the commonest site of injury due to a fall at home whereas outside falls caused more lower limb injuries.

Table2.6: Relationship between place of fall & site of injury

	Site of injury				
Place of fall	Head & Neck	Trunk & Abdomen	Upper limb	Lower Limb	**Sig**
Home	138(32.7%)	83(19.7%)	76(18.0%)	125(29.6%)	0.00
Outside	6(11.8%)	8(15.7%)	17(33.3%)	20(39.2%)	

Fig 2.6: Relationship between place of fall & site of injury



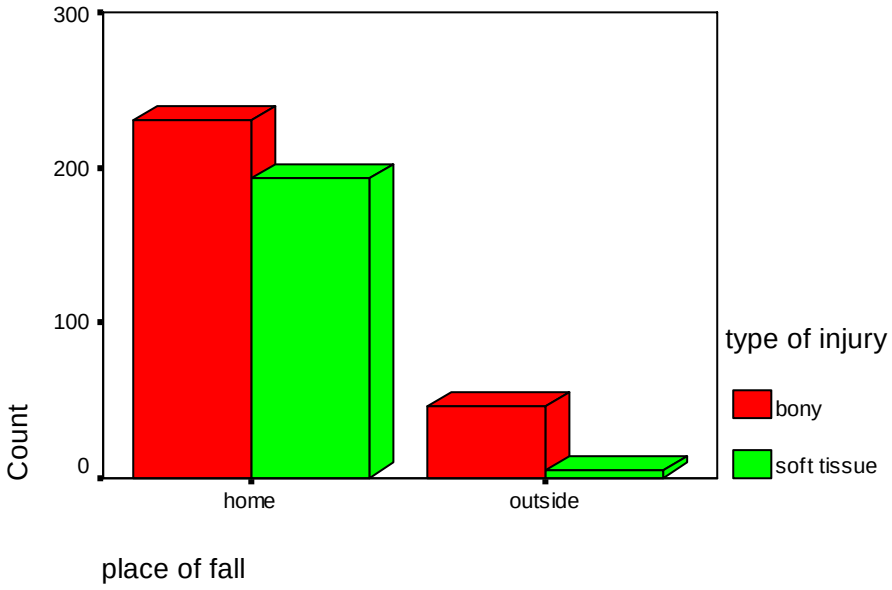
2.7 Place of fall & type of injury:

Falls outside the home resulted in mostly bony injuries (90.2%). Falls at home resulted in a fair distribution of bony as well as soft tissue injuries.

Table2.7: Relationship between place of fall & type of injury

	Type of injury		
Place of fall	Bony	Soft	**Sig**
Home	230 (54.4%)	193 (45.6%)	0.00
Outside	46 (90.2%)	5 (9.8%)	

Fig 2.7: Relationship between place of fall & type of injury



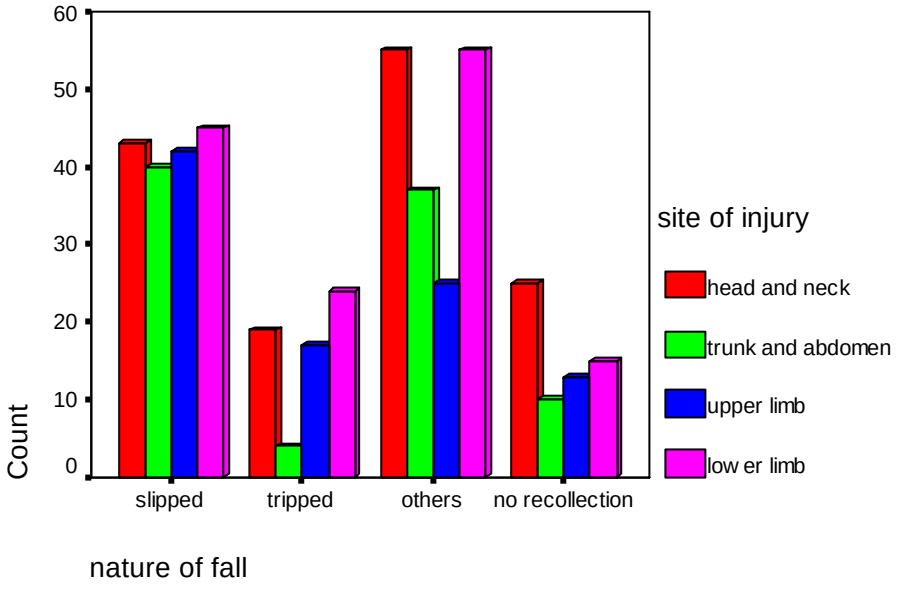
2.8 Nature of fall & site of injury:

Trips caused more lower limb injuries. Mechanisms other than slips and trips caused more head & neck injuries. However, slips caused injuries almost equally in all the sites.

Table2.8: Relationship between nature of fall & site of injury

Nature of fall	Site of injury				Sig
	Head & Neck	Trunk & Abdomen	Upper limb	Lower Limb	
Slips	43(25.3%)	40(23.5%)	42(24.7%)	45(26.5%)	0.02
Trips	19(29.7%)	4(6.3%)	17(26.6%)	24(37.5%)	
Others	55(32.0%)	37(21.5%)	25(14.5%)	55(32.0%)	
No recollection	25(39.7%)	10(15.9%)	13(20.6%)	15(23.8%)	

Fig 2.8: Relationship between nature of fall & site of injury



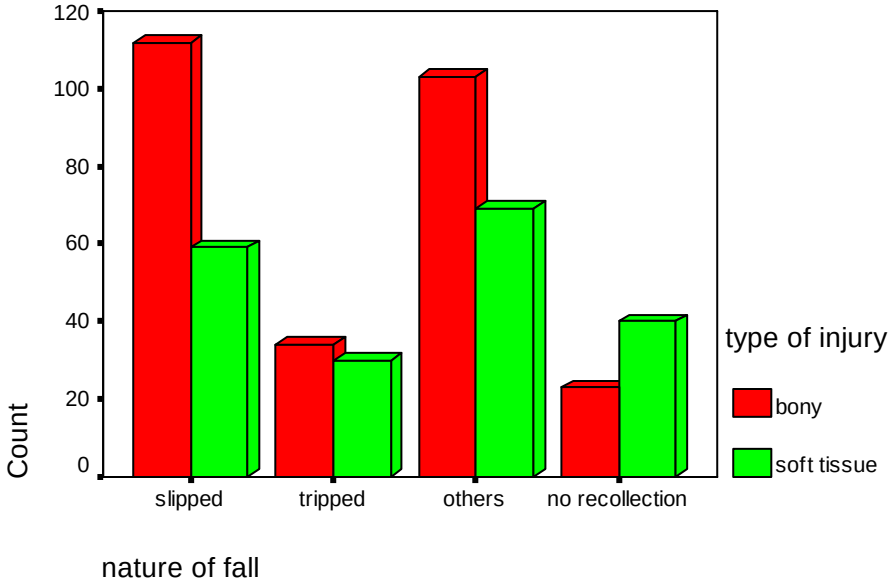
2.9 Nature of fall & type of injury:

Slips caused more bony than soft tissue injuries while trips caused almost similar numbers of bony and soft tissue injuries.

Table2.9: Relationship between nature of fall & type of injury

	Type of injury		
Nature of Fall	Bony	Soft	**Sig**
Slips	112 (65.5%)	59 (34.5%)	0.00
Trips	34 (53.1%)	30 (46.9%)	
Others	103 (59.9%)	69 (40.1%)	
No recollection	23 (36.5%)	40 (63.5%)	

Fig 2.9: Relationship between nature of fall & type of injury



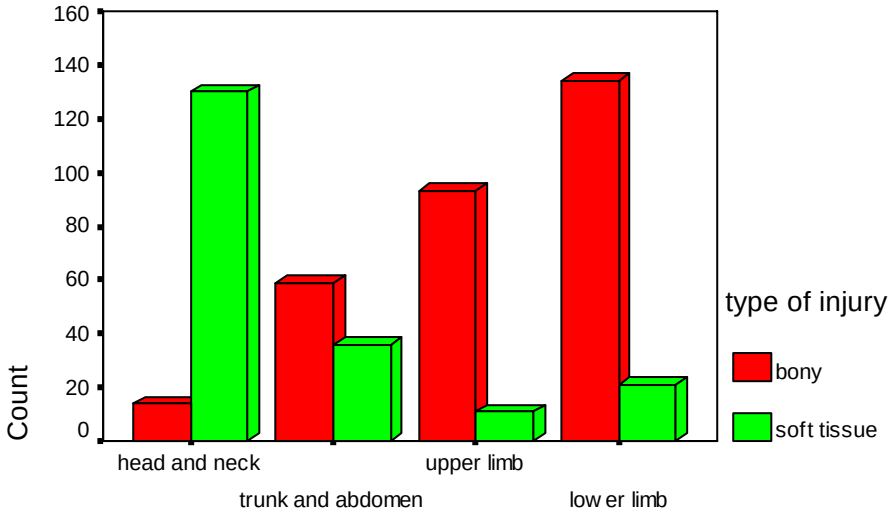
2.10 Site of injury & type of injury:

Upper / lower limb / trunk & abdomen injuries were mainly bony injuries while head and neck injuries were mainly soft tissue injuries.

Table 2.10: Relationship between site of injury & type of injury

	Type of injury		
Site of Injury	Bony	Soft	**Sig**
Head & Neck	14 (9.7%)	130 (90.3%)	0.00
Trunk & Abdomen	59 (62.1%)	36 (37.9%)	
Upper Limb	93 (89.4%)	11 (10.6%)	
Lower Limb	134 (86.5%)	21 (13.5%)	

Fig 2.10: Relationship between site of injury & type of injury



2.11 Relationship between variables that was not statistically significant:

Cross tabulation also revealed that the relationship between some of the variables was not statistically significant. We have summarised such relationships in the table below and also highlighted the outcomes.

Table 2.11: Relationship between variables that was not statistically significant

Relationship	Results
Age-group & place of fall	Majority of the falls in all the age-groups occurred at home.
Age-group & comorbid conditions	In all the 3 age-groups, most people had 1 comorbid condition.
Age-group & type of injury	In all the 3 age-group categories, bony injuries were more than soft tissue injuries.
Age-group & site of fracture	Fracture of the femur was the commonest site of fracture in all the 3 age-groups.
Gender & nature of fall	Slips were the primary mode of falls in females whereas for males, mechanisms apart from slips and trips, contributed to most of the falls.
Place of fall & nature of fall	Slips accounted for most home falls whereas most outside falls were due to mechanisms other than slips and trips.
Ethnicity & nature of fall	Most falls in the Chinese population were equally due to slips and trips. In Malays and others, falls were mainly due to trips and falls in Indians were mainly due to slips.
Ethnicity & site of injury	The Chinese population and others had more head & neck as well as lower limb injuries. Malays and Indians had more lower limb injuries.

Case Control Study

3. Description of the study population

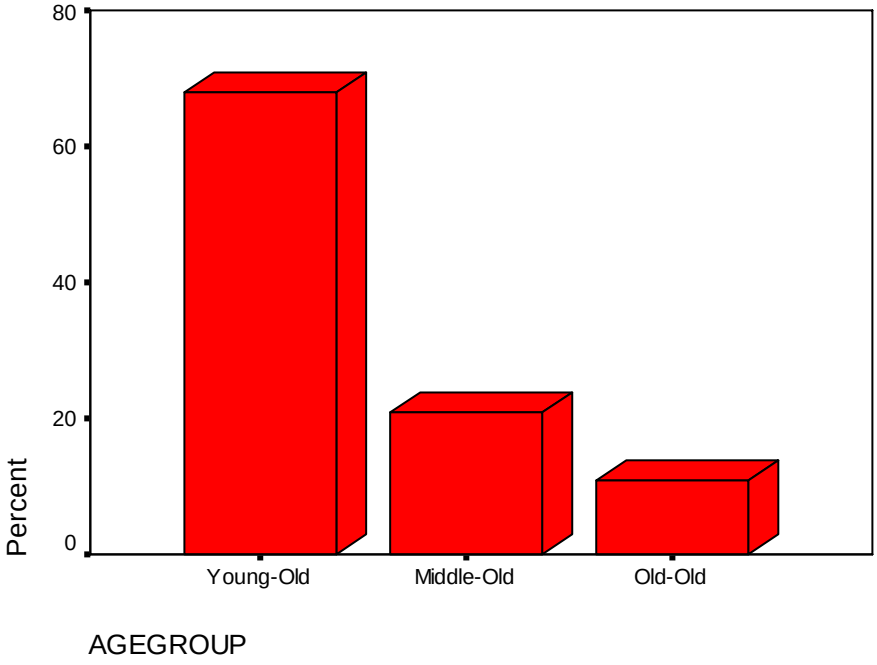
Socio-demographic Variables

3.1 Age:

The mean age in the study group was 72.1 years (SD 8.64) with the lower and upper ages being 60 and 100 years respectively.

The frequencies and percentages of the patients in the age groups 60-74, 75-84, 85 and above years were 68 (67.3%), 21 (28.5%) and 11 (10.9%) respectively.

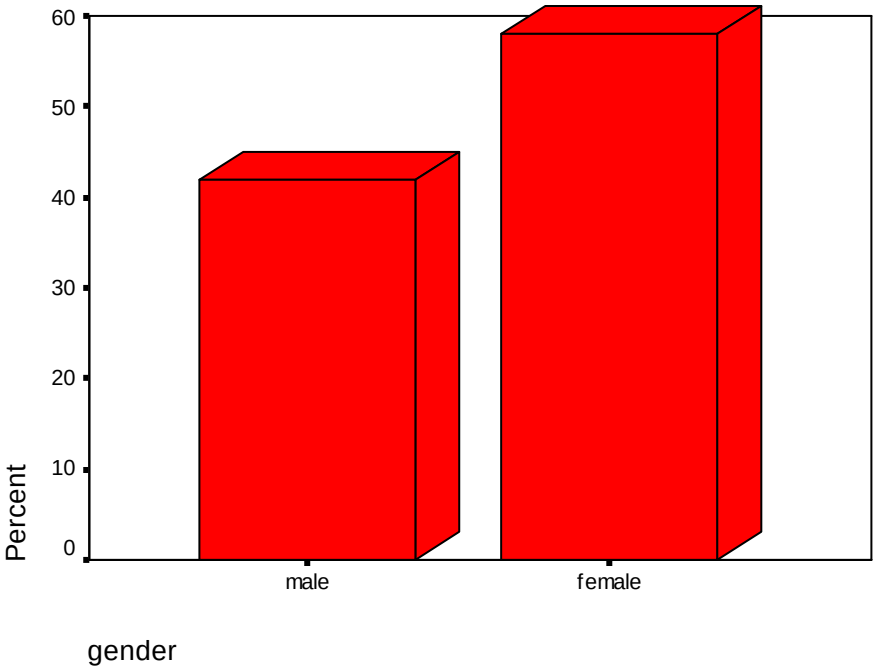
Fig 3.1: Age-group of the study population



3.2 Gender:

The proportion of females was 57.4% (n=58).

Fig 3.2: Gender of the study population



3.3 Ethnicity:

The ethnic distribution of the study population was as follows:

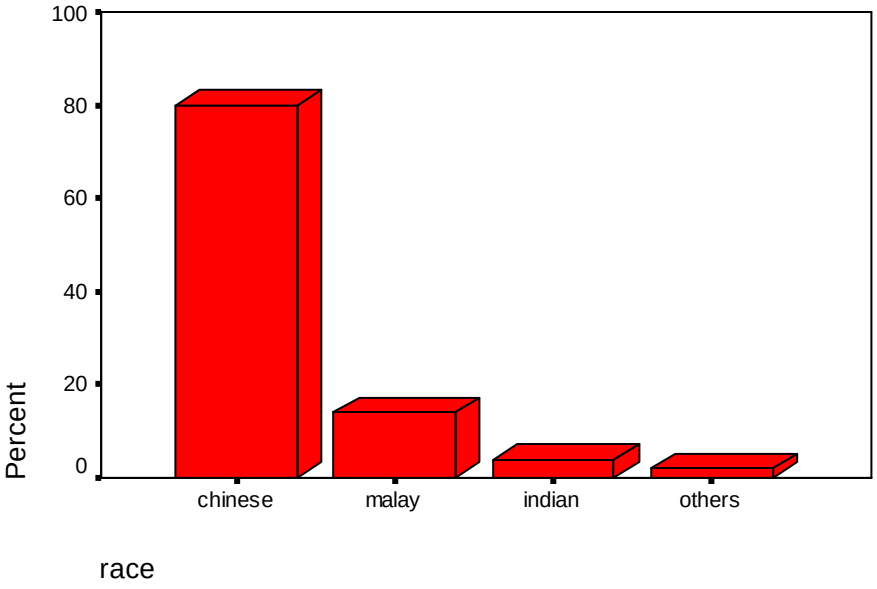
Chinese: (n= 80, 79.2%)

Malays: (n= 14, 13.9%)

Indians: (n= 4, 4%)

Others: (n= 2, 2%)

Fig 3.3: Ethnicity (race) of the study population



Socio demographic variables of cases and controls separately

Table 3.1: Socio demographic variables of cases and controls separately

Variable	Cases (n=25)	Controls (n=75)
Mean age	80 years	69 years
Gender		
Males	36%	44%
Females	64%	56%
Ethnicity		
Chinese	84%	78.7%
Malays	12%	14.6%
Indians	4%	4%
Others	0%	2.7%

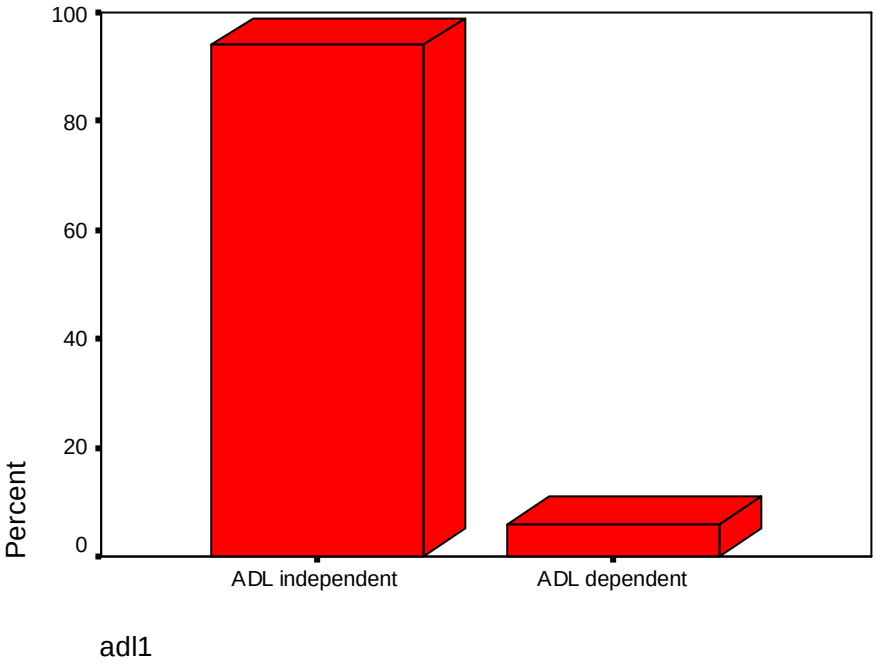
Clinical Variables

3.4 Functional Impairment (Katz Index):

The mean Katz index value of the study population was 5.68 (S.D. =1.07).

5.9% of the patients were functionally impaired (Katz Index value <= 4).

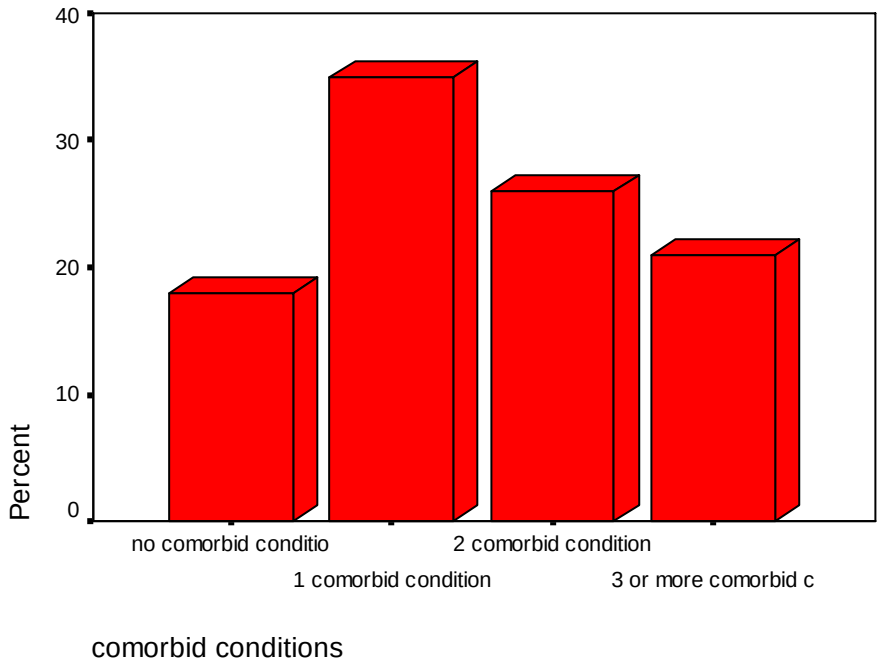
Fig 3.4: Functional impairment



3.5 Comorbid Conditions:

18 (17.8%) of the patients did not have any comorbid conditions. 35 patients (34.7%) had 1 comorbid conditions while 26 (20.8%) patients had 2 comorbid conditions and 21 (25.7%) had three comorbid conditions.

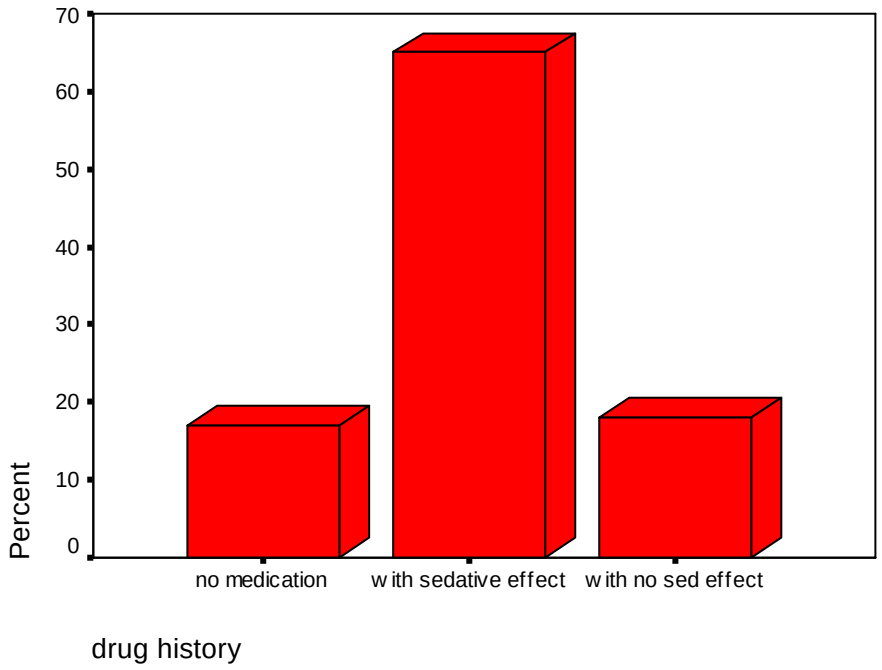
Fig 3.5: Presence of comorbid conditions



3.6 History of drug intake:

17 (16.8%) patients were not taking any medicines. Among the remaining study subjects, 64 (63.4%) patients were taking medicines with no sedative effect and 19 (18.8%) patients were taking medicines with a sedating effect.

Fig3.6: History of drug intake



Description of the fall

3.7 Place of fall:

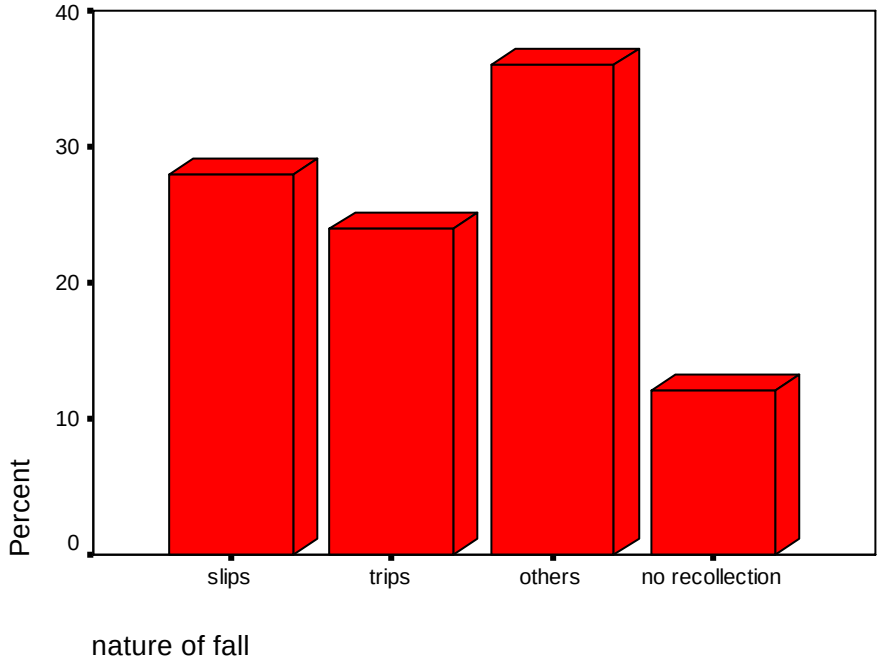
Among the 25 fallers, 23 (92%) patients had an episode of fall at home and the rest outside the home.

Fig 3.7: place of fall

3.8 Nature of Fall:

7 (28%) patients who had an episode of fall, had slipped whereas 6 (24%) patients had tripped.

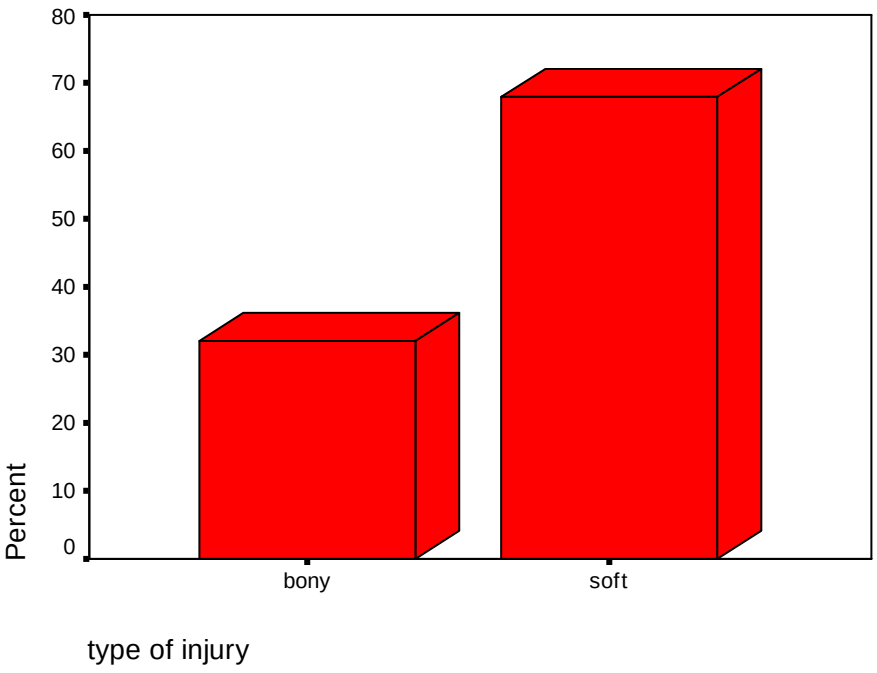
Fig 3.8: nature of fall



3.9 Type of Injury:

17 (68%) patients had a soft tissue injury and 8 (32%) patients had a bony injury.

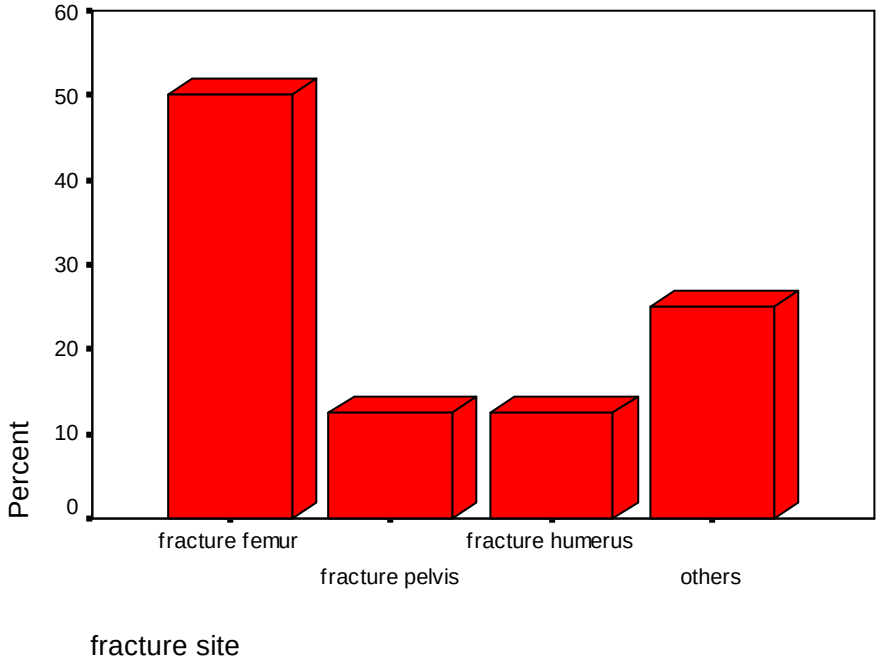
Fig 3.9: Type of injury



3.10 Site of Fracture:

Among the 8 patients with bony injury, 4 patients (50%) had fracture of the femur, 1 patient (12.5%) had fracture of the pelvis, 1 patient (12.5%) fracture of the humerus and 2 patients (25%) had fractures of bones other than those mentioned above.

Fig 3.10: Site of Fracture



4. Univariate and multivariate analyses of variables associated with the fall

Univariate analysis of variables associated with the fall

4.1 Significant predictors associated with the fall on univariate analysis:

The significant predictors associated with the fall were:

i) Age:
- Middle-Old (75-84 years)
- Old-Old (85 years and above)

ii) Functional impairment

Table 4.1: Significant predictors of fall on univariate analysis

Variables	O.R.	95% C.I.
Age		
Young Old (60-74 yrs.)	Reference	
Mid Old (75-84 yrs.)	9.39	2.83, 31.13
Old-Old (> = 85 yrs.)	46.49	8.11, 266.60
Functional Impairment		
ADL Independent	Reference	
ADL Dependent	18.49	2.04, 167.43

4.2 Variables associated with the fall on univariate analysis, that were not statistically significant

Univariate analyses of the following predictors associated with the fall were not statistically significant:

- Gender
- Ethnicity
- Presence of comorbid conditions
- History of drug intake

Table 4.2 Variables associated with the fall on univariate analysis, that were not statistically significant

Variables	O.R.	95%C.I.
Gender		
Male	Reference	
Female	1.39	0.54, 3.55
Race		
Chinese	Reference	
Malays	0.76	0.19, 3.01
Indians	0.93	0.09, 9.50
Others	0.002	0.00, 2.4E+19
Comorbid Conditions		
No Comorbid Conditions	Reference	
One Comorbid Condition	0.41	0.16, 2.08
Two Comorbid Conditions	0.45	0.60, 2.28
Three or More Comorbid Conditions	0.51	0.15, 2.54
Drug History		
No Medication	Reference	
Medication without sedative effect	0.11	0.03, 0.37
Medication with sedative effect	0.35	0.08, 1.38

4.3 Multivariate analysis of the variables associated with the fall

On forward logistic regression at probability level 0.05 and removal at 0.1, the significant predictors of fall were:

i) Age:

- Middle-Old (75-84 years)
- Old-Old (85 years and above)

ii) Functional impairment

Table 4.3: Multivariate analysis of the variables associated with the fall

Variables	O.R.	95% C.I.
Age:		
Young Old (60-74 yrs.)	Reference	
Mid Old (75-84 yrs.)	11.50	2.99, 44.22
Old-Old (> = 85 yrs.)	62.57	9.86, 396.87
Functional Impairment:		
ADL Independent	Reference	
ADL Dependent	35.26	2.92, 424.45

DISCUSSION

DISCUSSION

Discussion of the main findings:

The case control study provided useful information which verifies known predictors of falls in the elderly as well as the nature of the injury. The significant independent predictors were found to be increasing age and functional impairment.

In our research study, we found that increasing age and functional impairment were significant independent predictors of falls in the elderly who presented at the Emergency Department of the National University Hospital, Singapore. Increasing age has been found to be an independent predictor of falls in previous research studies (5, 9, 16, 36). Similarly, functional impairment has also been found to be a predictor of falls (9, 35). However, Hale et al (13), in their study, did not find functional impairment as a significant independent predictor of fall. We presume that with increasing age and functional impairment, physiological changes occur in the body. As a result, reaction time, reflexes and mobility are affected. The cumulative effect of all these will understandably cause increased incidence of falls. The other possible reason could be that with increasing age, medical conditions like vision and hearing impairment set in, which have been reported as significant independent predictors of falls in previous studies. This can lead to increased risk of falling.

We also found that comorbid conditions and history of drug intake (sedatives and non sedatives) were not significant predictors of fall. However, fallers had more history of drug intake and more comorbid conditions as compared to non fallers. This may be due to side effects of various drugs which might be hindering the normal activities of the body, e.g. postural hypotension in hypertensive patients. In previous research studies, inconsistent reports regarding the relationship of comorbid conditions and history of drug intake, in relation to falls, have been found. Some of the previous studies have found a positive association of drug intake with falls (9, 14, 17, 34) while Hale et al (13) in their study did not found history of medication to be a significant predictor of falls. As for comorbid conditions, Morse et al (34) and Tideiksaar (23) found comorbid conditions to be related to falls.

In our research study, fallers were mostly females as has been found in previous research studies (5, 9, 16, 24). However, gender was not an independent significant predictor of falls in our study.

Again, in our research study, more episodes of falls were due to slips and trips as has previously been found by Berg et al (3). From this finding, we can conclude that maximum number of falls occurred during activity and related to extrinsic factors like slippery floors, slippery bathrooms, poor lighting and improper layout of furniture in the house.

Fallers had mainly lower limb injuries as compared to injuries affecting other parts of the body as has been reported by Hale et al (13). Among the injuries, bony injuries were more

than soft tissue ones and females had more bony injuries than males. This has also been reported by Luukinen et al (37). This might be explained by the fact that with increased age, density of bone decreases making it more brittle and hence causes fracture at the slightest trauma. However, in our case control study, soft tissue injuries were found to be more than the bony injuries. We presume this could be due to a small sample size. Interestingly, Berg et al (3) also found more soft tissue injuries in their research study.

In our study, we also found that majority of falls took place at home rather than outside as has been reported previously by Hale et al (13). Possible reasons may be that most fallers belonged to the middle-old and old-old group and most of these elderly are generally home bound as compared to the young-old group, who tend to be more mobile. This finding could be related to presence of home hazards also. Presence of home hazards was found to be significantly related to falls by Day et al (41) though Northridge et al (19) did not find falls to be strongly associated with home hazards.

Limitations of the study:

The case control study had a small sample size. 25 fallers were compared with 75 community controls. This might explain why certain variables which were known to be predictors of falls in other studies were not found to be significant in our study.

The first part of the study involved retrospectively collecting data from the computerised patient records. As with most retrospective data, there was missing information encountered on certain variables. This might have affected our study findings.

This research study was conducted in only one hospital and in only one polyclinic in Singapore. Hence, there is a possibility of selection bias being present. The patient profile might be different in other hospitals and it might be based on the type of housing they live in. Consequently, the study findings cannot be generalised or extrapolated to the whole of Singapore

CONCLUSION & RECOMMENDATIONS

CONCLUSIONS & RECOMMENDATIONS

Since increasing age (75 years and above) and functional impairment are significant independent predictors of falls, we should pay more attention to people in these sub groups in order to prevent them from falling and causing morbidity/mortality.

Home is where most falls occurred. We should be looking at modifications to the existing home environment to make them safe from falls. It will help minimise extrinsic factors causing slips and trips and contributing towards a fall.

Apart from that, we should also look at intrinsic factors and help maintain stability of the persons prone to falling. This may be achieved with a structured exercise programme customised for different sub groups of the elderly.

Fracture of the femur was the commonest. Attention to protecting this part of the anatomy will be highly relevant to those at risk. However, we need more information on whether the use of hip protectors can help in this aspect.

Other intrinsic conditions may also demand attention in the elderly group who are more prone to falls. These include an assessment of cognitive, vision and hearing impairment among others. We recommend a further prospective study to take into account all these variables in order to have a complete picture on the predictors of falls in the elderly in Singapore.

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APPENDIX

Appendix I

Serial No.

PREDICTORS OF FALLS IN THE ELDERLY IN SINGAPORE

1. Name:

2. NRIC No:

3. Age:

4. Gender: Male Female

5. Race: Chinese
   Malays
   Indians
   Others

6. Address & Phone No.

7. Fall

   Place of Fall: Home
   Outside

   Nature of Fall: Slips
   Trips
   Others
   No recollection

8. Reported site of injury: Head & neck
   Trunk & Abdomen
   Upper limbs
   Lower limbs

9. Type of Injury: Bony
Soft tissue

10. Site of fracture: Femur
Pelvis
Humerus
Colles
Others

11. Co-morbid conditions 0 1 2 >2

12. Drug History

a. No medication
b. Medication with no sedative effect
c. Medication with sedative effect

Katz Index of Independence in Activities of Daily Living

ACTIVITIES Points (1 or 0)

INDEPENDENCE: (1 POINT) NO supervision, direction or personal assistance

DEPENDENCE: (0 POINTS) WITH supervision, direction, personal assistance or total care

BATHING Points: _____

(1 POINT) Bathes self completely or needs help in bathing only a single part of the body such as the back, genital area or disabled extremity.

(0 POINTS) Needs help with bathing more than one part of the body, getting in or out of the tub or shower. Requires total bathing.

DRESSING Points: _____

(1 POINT) Gets clothes from closets and drawers and puts on clothes and outer garments complete with fasteners. May have help tying shoes.

(0 POINTS) Needs help with dressing self or needs to be completely dressed.

TOILETING Points: _____

(1 POINT) Goes to toilet, gets on and off, arranges clothes, cleans genital area without help.

(0 POINTS) Needs help transferring to the toilet, cleaning self or uses bedpan or commode.

TRANSFERRING Points: _____

(1 POINT) Moves in and out of bed or chair unassisted. Mechanical transferring aides are acceptable.

(0 POINTS) Needs help in moving from bed to chair or requires a complete transfer.

CONTINENCE Points: _____

(1 POINT) Exercises complete self control over urination and defecation.

(0 POINTS) Is partially or totally incontinent of bowel or bladder.

FEEDING Points: _____

(1 POINT) Gets food from plate into mouth without help. Preparation of food may be done by another person.

(0 POINTS) Needs partial or total help with feeding or requires parenteral feeding.

TOTAL POINTS = _____

6 = High (patient independent)

0 = Low (patient very dependent)